Lung ultrasound integrated with clinical assessment for the diagnosis of acute decompensated heart failure in the emergency department: a randomized controlled trial.

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Abstract

AIMS: Although acute decompensated heart failure (ADHF) is a common cause of dyspnoea, its diagnosis still represents a challenge. Lung ultrasound (LUS) is an emerging point-of-care diagnostic tool, but its diagnostic performance for ADHF has not been evaluated in randomized studies. We evaluated, in patients with acute dyspnoea, accuracy and clinical usefulness of combining LUS with clinical assessment compared to the use of chest radiography (CXR) and N-terminal pro-B-type natriuretic peptide (NT-proBNP) in conjunction with clinical evaluation.

METHODS AND RESULTS: This was a randomized trial conducted in two emergency departments. After initial clinical evaluation, patients with acute dyspnoea were classified by the treating physician according to presumptive aetiology (ADHF or non-ADHF). Patients were subsequently randomized to continue with either LUS or CXR/NT-proBNP. A new diagnosis, integrating the results of both initial assessment and the newly obtained findings, was then recorded. Diagnostic accuracy and clinical usefulness of LUS and CXR/NT-proBNP approaches were calculated. A total of 518 patients were randomized. Addition of LUS had higher accuracy [area under the receiver operating characteristic curve (AUC) 0.95] than clinical evaluation alone (AUC 0.88) in identifying ADHF ($P < 0.01$). In contrast, use of CXR/NT-proBNP did not significantly increase the accuracy of clinical evaluation alone (AUC 0.87 and 0.85, respectively; $P > 0.05$). The diagnostic accuracy of the LUS-integrated approach was higher then that of the CXR/Nt-proBNP-integrated approach (AUC 0.95 vs. 0.87, $p < 0.01$). Combining LUS with the clinical evaluation reduced diagnostic errors by 7.98 cases/100 patients, as compared to 2.42 cases/100 patients in the CXR/Nt-proBNP group.

CONCLUSION: Integration of LUS with clinical assessment for the diagnosis of ADHF in the emergency department seems to be more accurate than the current diagnostic approach based on CXR and NT-proBNP.